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PROGRESS REPORT TO OFFICE OF NAVAL RESEARCH

FOR CONTRACT NO: N00014-90-C-0123

TITLE: Development of an Expendable Particle Sensor

ITEM NO: 0001AC

DATE: 6 May 92

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Principal Investigator

PROGRESS REPORT: Development of an Expendable Particle Sensor

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INTRODUCTION:

This report documents progress on the Phase II Development of the Expendable Particle Sensor (EPS) over the time period of December 1991 through January 1992. During this time period we determined the noise level of the telemetry system with the Printed Circuit Board (PCB) developed in November 1991. In addition, we had a PCB expansion card made which contained the electronics of receiver end of the telemetry system. Sea Tech, Sparton of Canada, and ONR personnel met in London, Ontario, where we demonstrated the telemetry system and discussed the status of the EPS development.

RESULTS:

Sea Tech tested the noise level of the telemetry system with the PCB transmitter electronics. As Figure 1 shows, the 7660 negative voltage converter caused unacceptable noise levels. We therefore decided to eliminate the 7660 from our design and instead use 2 batteries for out positive and negative supply voltages. Without the 7660, and with the scattering sensor electronics disabled, we found that the noise floor of the telemetry system was approximately 0.025% of full scale, as shown in Figure 2. When we connected the scattering sensor, we found that the noise increased to about 0.05% of full scale, as shown in Figure 2. Assuming full scale for the scattering sensor is set to 10 mg/l of total suspended particle mass then 0.05% system noise will provide resolution of 5 μg/l. For comparison purposes this performance is roughly equivalent to that of the Sea Tech 25 cm red LED transmissometer connected to a data acquisition system with 12 bits resolution.

Sea Tech contracted Acculay of Corvallis, OR to design a PCB for the telemetry receiver electronics to fit into an IBM compatible personal computer 8-bit expansion slot. The telemetry receiver schematic is shown in Figure 3; the board we received from Acculay is shown in Figure 4 at 1/2 its actual size.

Sea Tech and Sparton personnel met in London, Ontario January 13-16. At this meeting, we were able to demonstrate operation of the telemetry system and successfully send and receive data through Sparton's existing VHF link. This meeting also served as an opportunity for Sea Tech to brief Sparton and ONR on the progress of the EPS development up to that time, and for the three parties involved to plan the further development of the EPS.

While successfully demonstrating the telemetry system on an 8086-based personal computer at Sparton of Canada, we found that the telemetry receiver electronics did not function properly with 386-based personal computer. This problem will be solved at a later.

FIGURES 1 to 4

Figure 1. Telemetry Noise 1/3/91 Using ICL7660

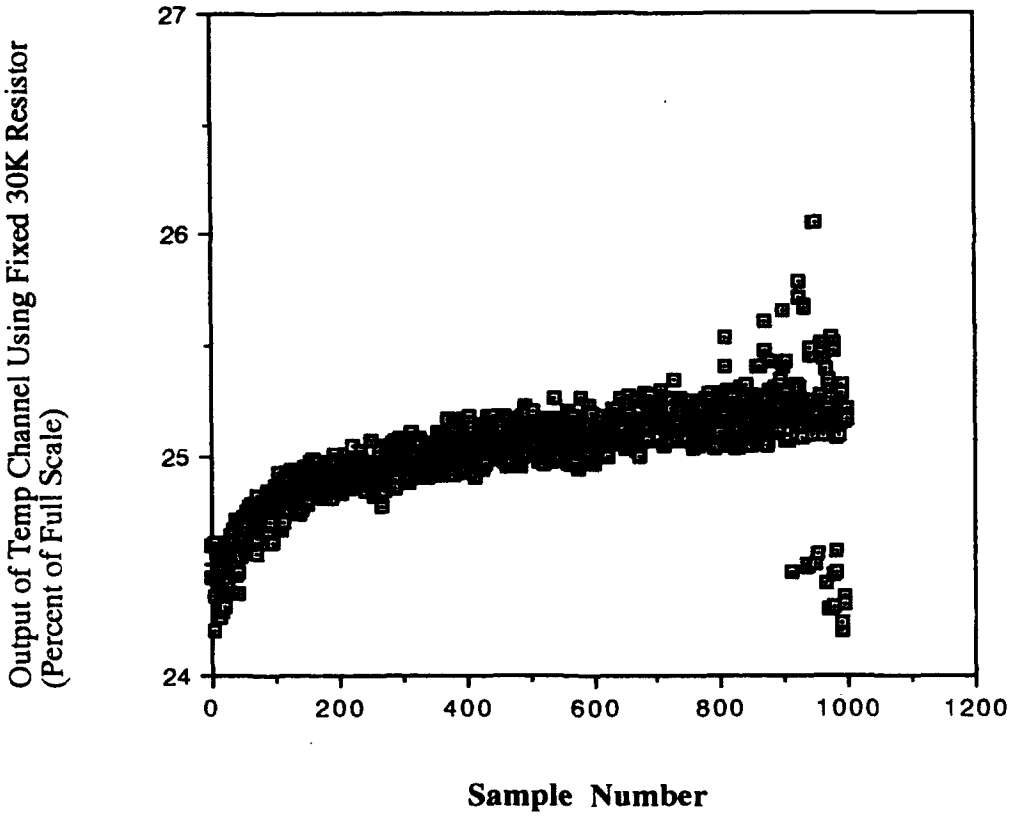
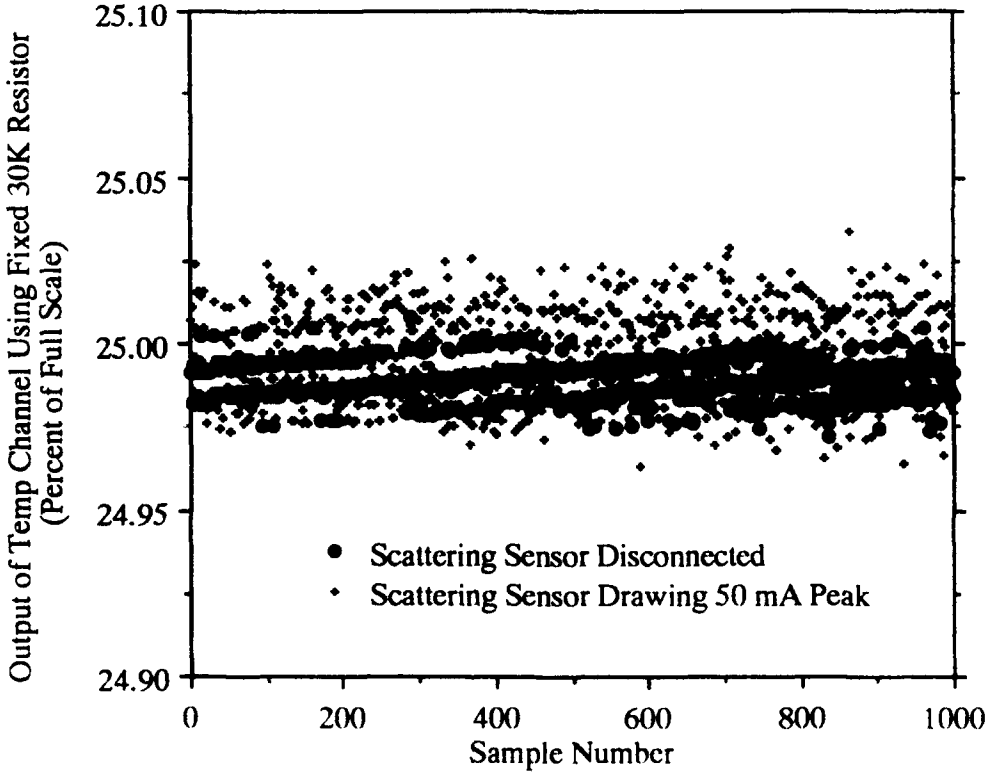


Figure 2 Telemetry System Noise with 2 Batteries



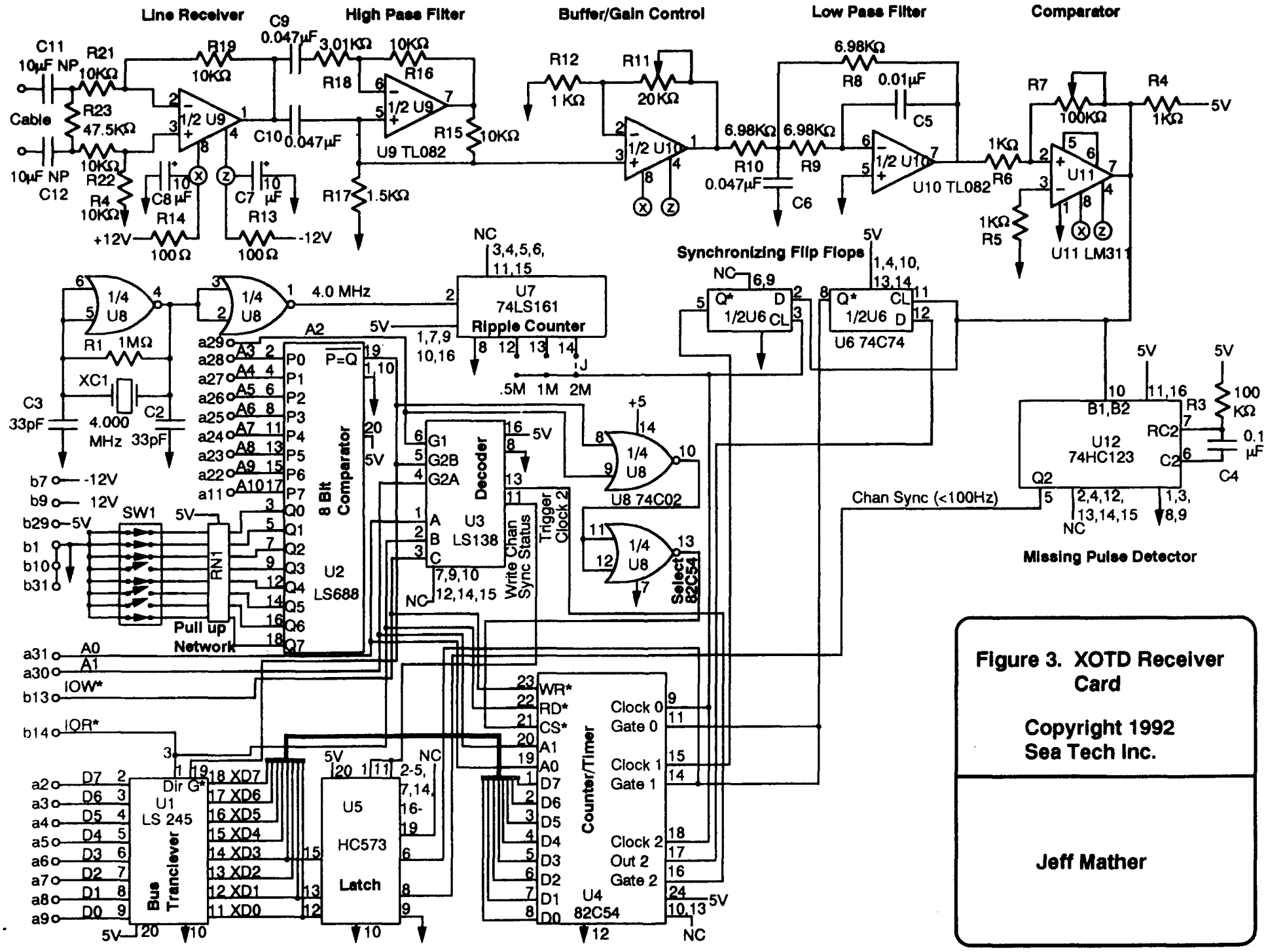


Figure 3. XOTD Receiver Card

Jeff Mather

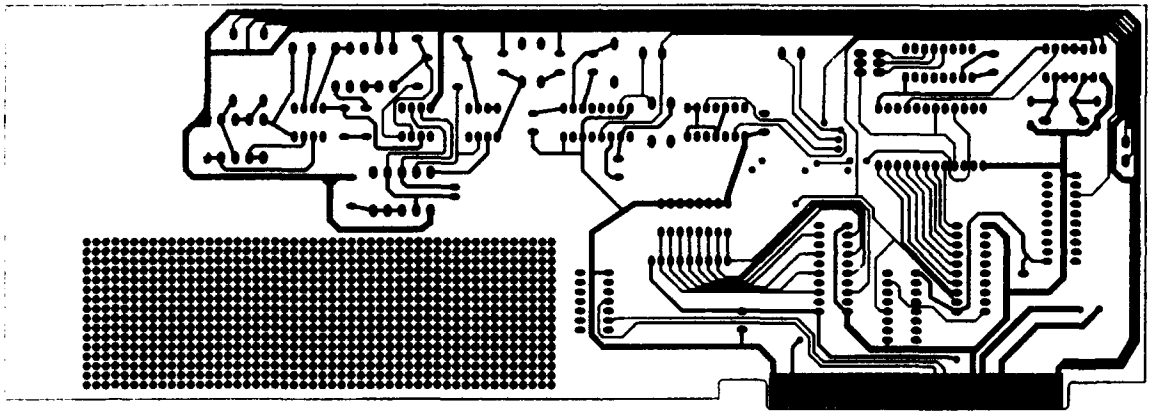


Figure 4. Telemetry Receiver Card for IBM Compatible PC